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SUBJECT: Description of a Confidential Memorandum on Nuclear Materials Research in the Nerva Program Case 720

DATE: September 18, 1968

FROM: D. J. Osias

MEMORANDUM FOR FILE

A Confidential/Restricted Data Memorandum for File[1] written by this author has been given limited distribution. The memorandum discusses the nuclear materials research being performed as part of the Nerva program. The following is an unclassified summary and description of the classified memorandum.

Fuel research can be separated into that relating to graphite fuel and that relating to advanced fuel forms such as carbon-metal carbide composites and metal carbide-uranium carbide solid solutions. Corrosion of graphite fuel by hot hydrogen is the factor which limits the operating temperature and endurance of the Nerva reactor. Other areas such as thermal stress and containment of uranium also require continuing work to avoid restricting reactor operations. With advanced fuel forms corrosion becomes a lesser problem, as does uranium containment, but thermal stresses become more severe. Also, the difficulties encountered in fabricating carbide or composite fuels are currently prohibitive.

The PEEWEE reactor is a smaller reactor than the Nerva I (Nerva II has been discontinued), but it uses the same fuel elements. The PEEWEE program was established to enable testing of Nerva fuel elements in the actual reactor environment while using a smaller, and hence less expensive, reactor and test facility.

The details of the research, including proposed solutions to the limiting problems, are discussed in the classified memo. In addition to fuel materials, some of the structural materials and the general reactor construction are discussed briefly.

The steady progress in increasing reactor operating temperatures is encouraging. It now seems that the hope of an I_{sp} of 900 seconds with operating times of a few hours is not overly optimistic. It also appears that I_{sp}'s above 900 seconds will not be achieved with the solid core Nerva design.

D. J. Osias

1013-DJO-nma

REFERENCES

Osias, D. J., "Materials Research in the Nuclear Rocket Program," (U) dated September 16, 1968, CONFIDENTIAL Document No. 68-2003.